

### **REMARKS**

After the foregoing amendment, claims 17-27 and 29-42, as amended, are pending in the application. Claims 17-27 and 29-42 have been amended to more particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Claim 28 has been canceled. Applicant submits that no new matter has been added to the application by the Amendment.

#### **Objections to the Drawings**

The Examiner objected to the drawings because reference numbers in Figs. 6B-F, 7, 9, 10, 12-19, 44 A-C, 69 and 71 A-B lack descriptive legends or labels. Applicant respectfully traverses the objection.

37 C.F.R. § 1.83 states that the drawings must show every feature of the invention specified in the claims. 37 C.F.R. § 1.83 further states that conventional features disclosed in the description and claims, where their detailed illustration is not essential for an understanding of the invention, should be illustrated in the form of a graphical symbol or a labeled representation.

Applicant submits that the drawings show every feature of invention specified in the claims and that one of ordinary skill in the art would understand the invention without additional labeling. Applicant further submits that 37 C.F.R. § 1.83, by the use of the word should, clearly states that there is no requirement for labeling a reference number. Further the MPEP is devoid of any instruction to label a reference number.

Also, the labeling of the figures of the present application is consistent with the labeling of the figures of Patent No. 6,657,998, the specification and figures of which are substantially the same as the present application.

In view of the fact that the burden for labeling the reference numbers is large and that labeling is not a requirement, Applicant respectfully requests reconsideration and withdrawal of the objection to the drawings.

#### **Objections to the Specification**

The Examiner objected to the specification for having incorrect references to the figures. Applicant has amended the specification, as shown on page 2 of the Amendment, to correct the references to the figures. Applicant has also amended the Brief Description of the

Drawings on pages 13, 14 and 17 of the specification as shown on page 2 of the Amendment to: (1) correct Fig. 28A to read Fig. 28B, (2) correct Fig. 33A-D to read Figs. 33A-F and (3) has added a brief description of Figs. 56A-D. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the objections to the specification.

### **Claim Objections**

The Examiner objected to the claims for a variety of informalities. Applicant has amended the claims in accordance with the Examiner's suggestions with the exception of objection numbers 3n and 3p. Applicant submits in the case of objections numbered 3n and 3p that subscripted "p" is clearly defined as an r-bit string with an index running from 1 to r representing  $2^r$  classes. Applicant also submits that the amendment to claim 17, wherein n is defined as  $2^n$  input/output ports, clearly defines "n" for claim 18. Such a definition for "n" is also suggested as adequately defining "n" in claims 22, 36 and 41. Since Applicant has addressed all of the Examiner's objections, Applicant respectfully requests reconsideration and withdrawal of the objections to the claims.

### **Double Patenting Rejection**

The Examiner provisionally rejected claims 17, 22 and 41 under the judicially created doctrine of obvious type double patenting over claims 3, 5, 9 and 10 of copending application No. 09/882,112. The Examiner stated that a timely filed terminal disclaimer in compliance with 37 C.F.R. 1.321 may be used to overcome the actual or provisional rejection providing the conflicting patent is shown to be commonly owned.

A Terminal Disclaimer and Statement of Common Ownership signed by Applicant's registered attorney of record is attached herewith. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the provisional double patenting rejection of claims 17, 22 and 41.

### **Rejection - 35 U.S.C. § 102**

The Examiner rejected claim 17 under 35 U.S.C. § 102 as being unpatentable over U.S. Patent No. 5,987,028 (Yang et al.). Applicant respectfully traverse the rejection.

Amended claim 17 recites:

*A method for self-routing a packet to a given destination address through a bit-permuting network having  $2^n$  input ports and  $2^n$  output ports, the network being characterized by a guide, the method comprising:*  
*generating a routing tag for the packet based on the guide of the network and the destination address, and*  
*routing the packet through the network using the routing tag.*

Yang et al. is directed to a system and method for routing a received packets through a switch fabric. Yang et al. teaches the use of a routing tag which is a binary consisting of a control sequence and a binary representation of an output port address (col. 10, lines 9-14). The control sequence is generated by the iterative process (col. 11, lines 9-11) described at col. 11, line 4 to col. 18, line 13.

Amended claim 17 recites “generating a routing tag based on a guide of the network and the destination address.

As described at page 81, line 14 of the application, a guide is the sequence:

$(\sigma_1 \sigma_2 \dots \sigma_{k-1})(n), (\sigma_2 \dots \sigma_{k-1})(n), \dots, (\sigma_{k-2} \sigma_{k-1})(n), \sigma_{k-1}(n), n,$

where,  $2^n$  is the number of input/output ports of the network,  $k$  is the number of stages in the network and  $\sigma_k$  is the permutation between the  $k-1$  stage and  $k$  stage of the network. Simply stated, as can be appreciated by referring to the description at pages 88-89, the guide characterizes the state of each cell, (bar or cross) in each stage of the network while the parameter  $\sigma$  describes the interconnections between each stage. As further described starting at page 174, and Figs. 66A, B C and D, the routing tag, and thereby the route taken by a packet through the network, is determined from the input address of the network at which the packet is received, the output address to which the packet is to be delivered and the guide.

The claimed method for constructing a routing tag is different from the method disclosed by Yang et al. The method disclosed by Yang et al. requires a process that iterates

over each control stage (col. 11, lines 4-11) to determine the contents of the routing tag. In contrast, the amended claim 17, uses a characterization of the network referred to as a guide of the network, computed as the binary string  $(\sigma_1\sigma_2 \dots \sigma_{k-1})(n)$ ,  $(\sigma_2 \dots \sigma_{k-1})(n)$ , ...,  $(\sigma_{k-2}\sigma_{k-1})(n)$ ,  $\sigma_{k-1}(n)$ ,  $n$ . Such a string does not require computation by the iterative process taught by Yang et al.. Further, the method disclosed by Yang et al. is specific to a Benes type network. Advantageously, the method of amended claim 17 is applicable to any bit-permuting network, including but not limited to Banyan type networks, baseline networks, Omega networks and divide and conquer networks.

Applicant submits that Yang et al. does not anticipate claim 17. Accordingly Applicant respectfully requests reconsideration and withdrawal of the §102 rejection of claim 17.

#### **Rejection - 35 U.S.C. § 102**

The Examiner rejected claims 17-20, 22-26, 30-32 and 41 under 35 U.S.C. § 102 as being unpatentable over U.S. Patent No. 6,335,930 (Lee). Applicant respectfully traverses the rejection.

#### Claims 17-20

Lee discloses an interconnection network referred to as a bypassing Omega network. The network comprises  $N$  input ports,  $N$  output ports,  $N/2$   $M \times M$  switching elements per stage and  $\text{LOG}_M N$  stages. Each switching element comprises  $X$  bypassing input ports,  $M-X$  input routing ports,  $X$  bypassing output ports and  $M-X$  output routing ports. The number of bypassing ports,  $X$ , is 1 or an integer more than 1.

As in a conventional Omega network, Lee teaches using the destination address as the routing tag (col. 9, lines 65-67). The routing tag in an Omega network is a binary equivalent of the destination,  $(d_{n-1} d_{n-2} \dots d_1 d_0)$ . The  $i$ th bit  $d_i$  is used to control the routing at the  $i$ th stage counted from the right with  $0 \leq i \leq n-1$ . If  $d_i = 0$ , the input is connected to the upper output. If  $d_i = 1$ , it is connected to the lower output. Lee improves upon the basic Omega network by adding a third input and a third output port to each (internal) switching element, detecting packet contention for a destination address and switching the contending packet to a bypass port of the switching element when contention is detected.

Amended claim 17 recites a method for self-routing a packet to a given destination address through a bit-permuting network having  $2^n$  input ports and  $2^n$  output ports. As defined at page 53, lines 11-14 of the application, in order to be considered a bit-permuting network: (1) the switching elements must be 2x2 switches; (2) every stage of the network must consist of  $2^{n-1}$  2x2 switches, and (3) every exchange in the network must be bit-permuting.

The switching elements disclosed by Lee are not 2x2 switching elements. Since the number of bypassing ports for each element, X, must be one or more, the switching elements taught by Lee are at least 3x3 (see col. 8, lines 25-28). Also, Figs. 6 and 7 clearly show three inputs and three outputs from each switching element internal to the network. Consequently, the network disclosed by Lee is not a bit permuting network as expressly defined in the application.

Amended claim 17 also recites that a packet is routed through the network by a tag which is generated based on the guide of the network,  $(\sigma_1\sigma_2 \dots \sigma_{k-1})(n)$ ,  $(\sigma_2 \dots \sigma_{k-1})(n)$ , ...,  $(\sigma_{k-2}\sigma_{k-1})(n)$ ,  $\sigma_{k-1}(n)$ ,  $n$ .

Lee does not teach or suggest generating a routing tag based on a guide. Rather Lee teaches utilizes only the destination address for routing and relies on contention detection to perform alternate routing. Applicant submits that Lee does not anticipate amended claim 17. Accordingly, for all the above reasons, Applicant respectfully requests reconsideration and withdrawal of the § 102 rejection of claim 17.

Amended claims 18-20 each recite a more definitive use of the guide. Lee et al. does not teach or suggest using a guide computed as  $(\sigma_1\sigma_2 \dots \sigma_{k-1})(n)$ ,  $(\sigma_2 \dots \sigma_{k-1})(n)$ , ...,  $(\sigma_{k-2}\sigma_{k-1})(n)$ ,  $\sigma_{k-1}(n)$ ,  $n$ .

Further, it is respectfully submitted that since amended claim 17 has been shown to be allowable, amended claims 18-20, dependent on amended claim 17, are allowable, at least by their dependency. Accordingly, for all the above reasons, Applicant respectfully requests reconsideration and withdrawal of the § 102 rejection of claims 18-20.

#### Claims 22-26 and 30-32

Amended claim 22 recites a method for routing a packet through k stage bit-permuting network with a routing tag where the switching elements of the network are sorting cells and the routing tag is based on a guide.

As discussed above, Lee teaches a bypass Omega network. A bypass Omega network is not a bit permuting network because each of the switches is not a 2 x 2 switch. Further, as discussed above, Lee does not teach or suggest a routing tag, the contents of which are based on a guide. Also, Lee does not teach that each of the switching cells is a sorting cell. As defined at page 159, lines 11-15 of the application, a sorting cell is a 2 x 2 switching element associated with a partially ordered input set and the input signal switched to output-0 is never greater than the signal switched to output-1. A sorting cell which operates on the set{0, 1} where  $0 < 1$  has a truth table of:

Connection State		<u>Input-1 control Signal</u>	
		0	1
<u>Input-0 Control Signal</u>	0	Any	Bar
	1	Cross	Any

In contrast to amended claim 1, Lee teaches the use of 3 x 3 switching elements. Each of the two (or three) input ports of a switch can connect to any one of three output ports based on a control signal (not disclosed). The switches disclosed by Lee do not operate the same as the sorting cells defined in the present application. Applicant submits that Lee does not anticipate amended claim 22. Accordingly Applicant, for all the above reasons, respectfully requests reconsideration and withdrawal of the §102 rejection of claim 22.

Further, it is respectfully submitted that since amended claim 22 has been shown to be allowable, amended claims 23-26, and 30-32, dependent on amended claim 22 are allowable, at least by their dependency. Accordingly, for all the above reasons, Applicant respectfully requests reconsideration and withdrawal of the § 102 rejection of claims 23-26 and 30-32.

#### Claim 41

Amended claim 41 recites an apparatus for routing a tag through k stage bit-permuting network having a routing tag circuit for generating a routing tag, where the routing tag is based on a guide of the network. As discussed above, Lee does not teach or suggest either a bit-permuting network or a guide as they are defined in the present application. Applicant

submits that Lee does not anticipate amended claim 41. Accordingly Applicant, for all the above reasons, respectfully requests reconsideration and withdrawal of the §102 rejection of claim 41.

### **Rejection - 35 U.S.C. § 103**

The Examiner rejected claims 21 and 27 as being unpatentable over U.S. Patent No. 6,335,930 (Lee) in view of U.S. Patent No. 5,963,554 (Song). Applicant respectfully traverses the rejection.

The Examiner states that Lee discloses all the elements of claims 21 and 27 except that the network is a banyan-type network. The Examiner further states that Song teaches a banyan-type network . Applicant traverses the rejection.

Amended claim 21 depends from amended claim 17. Amended claim 17 recites a bit-permuting network which uses a routing tag whose contents are based on the guide of the network. With respect to amended claim 17, as discussed above, Lee does not teach or suggest generating a routing tag based on the guide.

Amended claim 27 depends from amended claim 22. Amended claim 22 further recites using a sorting cell as the switching element. With respect to amended claim 22, Lee does not teach or suggest generating a routing tag based on the guide or using a sorting cell as a switching element. Song is directed to a particular arrangement of unit switches and does not teach or suggest the use of a routing tag based on a guide or the use of a sorting cell. Consequently, Song does not make up for the foregoing deficiencies of Lee. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the §103 rejection of claims 21 and 27.

### **Rejection - 35 U.S.C. § 103**

The Examiner rejected claim 29 as being unpatentable over U.S. Patent No. 6,335,930 (Lee) in view of U.S. Patent No. 6,058,112 (Kerstein et al.). Applicant respectfully traverses the rejection.

The Examiner states that Lee discloses all the elements of claim 29 except for an idle packet. The Examiner further states that Kerstein et al. teaches an idle packet. Applicant traverses the rejection.

Amended claim 29 depends from amended claim 22. Amended claim 22 recites a bit-permuting network which uses a routing tag whose contents are based on the guide of the network. Amended claim 22 further recites using a sorting cell as the switching element. Lee does not teach or suggest a bit-permuting network or generating a routing tag based on the guide or using a sorting cell as a switching element. Kerstein et al. is directed to a decision making engine for monitoring a switch and does not teach or suggest a bit-permuting network or generating a routing tag based on the guide or using a sorting cell as a switching element. Consequently, Kerstein et al. does not make up for the foregoing deficiencies of Lee. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the §103 rejection of claims 29.

#### **Rejection - 35 U.S.C. § 103**

The Examiner rejected claims 33-35 as being unpatentable over U.S. Patent No. 6,335,930 (Lee) in view of U.S. Patent No. 5,987,028 (Yang et al.). Applicant respectfully traverses the rejection.

The Examiner states that Lee discloses all the elements of claim 33-35 except for processing related to the leading bits of the routing tag. The Examiner further states that Yang et al. teaches processing the leading bits of the routing tag. Applicant traverses the rejection.

Amended claims 33-35 depend from amended claim 22. Amended claim 22 recites a bit-permuting network which uses a routing tag whose contents are based on the guide of the network. Amended claim 22 further recites using a sorting cell as the switching element. Lee does not teach or suggest generating a routing tag based on the guide or using a sorting cell as a switching element. As discussed above, Yang et al. does not make up for the foregoing deficiencies of Lee. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the §103 rejection of claims 33-35.

#### **Rejection - 35 U.S.C. § 103**

The Examiner rejected claim 42 as being unpatentable over U.S. Patent No. 6,335,930 (Lee) in view of U.S. Patent No. 5,367,518 (Neuman). Applicant respectfully traverses the rejection.



The Examiner states that Lee discloses all the elements of claim 42 except for disclosing that each of the priority classes is coded in an r-bit string. The Examiner further states that Neuman teaches that real packets are classified into  $2^r$  classes. Applicant traverses the rejection.

Amended claim 42 depends from amended claim 41. Amended claim 41 recites a bit-permuting network which uses a routing tag whose contents are based on the guide of the network. As discussed above, Lee does not teach or suggest a bit-permuting network which uses a routing tag based on the guide. Neuman does not make up for the foregoing deficiencies of Lee. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the §103 rejection of claim 42.

#### **Allowable Subject Matter**

The Examiner objected to claims 36-40 as being dependent upon a rejected base claim but stated that claims 36-40 would be allowable if rewritten to overcome the objections in the Office Action. Applicant has amended claims 36-40 as discussed above to overcome the objections raised in the Office Action. Accordingly, Applicant respectfully requests allowance of claims 36-40.

**Conclusion**

Insofar as the Examiner's objections and rejections have been fully addressed, the instant application, including claims 17-27 and 29-42, is in condition for allowance and Notice of Allowability of claims 17-27 and 29-42 is therefore earnestly solicited.

Respectfully submitted,

**SHUO-YEN ROBERT LI**

July 5, 2005  
(Date)

By:

  
**LOUIS SICKLES II**

Registration No. 45,803

**AKIN GUMP STRAUSS HAUER & FELD LLP**

One Commerce Square

2005 Market Street, Suite 2200

Philadelphia, PA 19103-7013

Telephone: 215-965-1200

**Direct Dial: 215-965-1294**

Facsimile: 215-965-1210

E-Mail: lsickles@akingump.com

LS:lcd